Gastric Emptying in the Elderly

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KEYWORDS

• Gastric emptying • Migrating motor complex • Neural and humoral feedback
• Scintigraphy • Breath tests • Ultrasonography • Glycemia • Blood pressure

KEY POINTS

- The gastric and small intestinal motor and humoral mechanisms responsible for normal gastric emptying in humans are complex and highly variable.
- Healthy aging seems associated with modest slowing of gastric emptying, but emptying generally remains within the normal range for young subjects.
- Parkinson disease and diabetes are examples of comorbidities that increase with advancing age and frequently have an impact on gastric emptying.
- The effects of aging on gastric emptying/motility are of relevance to the absorption kinetics of oral medications as well as the regulation of appetite, postprandial glycemia, and blood pressure.

INTRODUCTION

This article reviews the impact of healthy aging on gastric emptying, related motor and sensory function of the upper gut, and what is known about the underlying causes of disordered gastric emptying and their clinical significance. The techniques that may be used to measure gastric emptying also are addressed. The effects of aging on gastric emptying are of potential relevance to the absorption of oral medications as well as the regulation of appetite, postprandial glycemia, and blood pressure. Aging is associated with an increased prevalence of several diseases associated with abnormal, in particular delayed, gastric emptying.

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MECHANISMS CONTROLLING GASTRIC EMPTYING

Gastric emptying reflects the coordinated motor activity of the proximal stomach, distal stomach (antrum and pylorus), and duodenum, which is controlled primarily by feedback from neural and humoral signals generated by the interaction of nutrients with the small intestine. The gastric and small intestinal mechanisms responsible for normal gastric emptying in humans are complex and highly variable: ingested food must be stored, mixed with digestive enzymes, ground into small particles, and delivered as a liquefied form to the duodenum at a rate that allows efficient digestion and absorption.

The Migrating Motor Complex

The synchronous periodic pattern of gastric motor activity during interdigestive/fasting periods, which moves from the stomach to the terminal ileum over a period of 90 to 120 minutes and is controlled by complex neurohumoral mechanisms, is called the migrating motor complex and comprises 4 phases.[1] This housekeeping complex generates peristaltic waves of activity and promotes passage of indigestible food products, cellular debris, and bacteria through the gastrointestinal tract. Phase I of the migrating motor complex is associated with motor quiescence with no contractions and lasts approximately 40 minutes; phase II is characterized by random contractions and lasts approximately 50 minutes (**Fig. 1**); and phase III is characterized by regular contractions with maximal amplitude for approximately 5 to 10 minutes (**Fig. 2**), followed by phase IV, a rapid decrease of the contractions, which may be absent or very short and, therefore, undetectable.

The migrating motor complex has a circadian pattern with reduced propagation velocity and shorter duration, particularly of phase II, at night. Contractions of the stomach are linked to an underlying electrical rhythm, generated by gastric pacemaker cells. These interstitial cells of Cajal are situated within the Auerbach plexus where they generate contractions within the antrum and pylorus at a rate of approximately 3 cycles per minute.[2] The muscular contractions are promoted by mediators, such

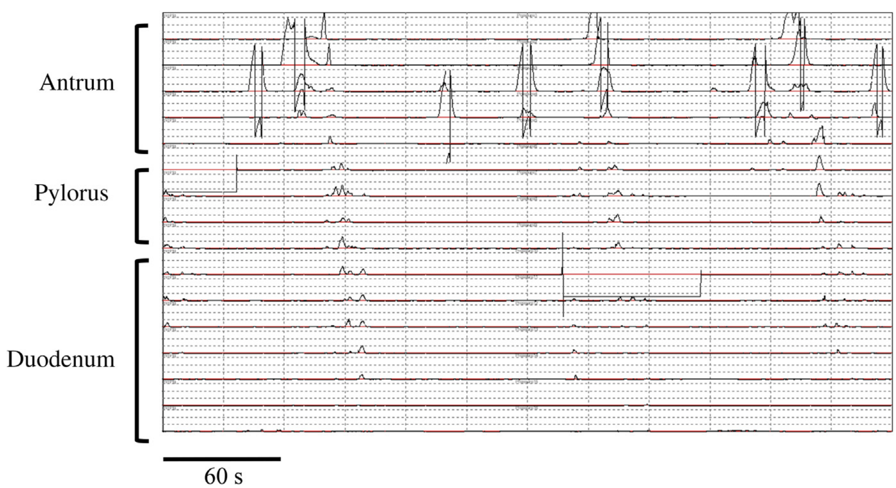

Fig. 1. Manometry recording during fasting conditions of irregular contractions of the migrating motor complex phase II, usually lasting approximately 50 minutes, using a 16-channel catheter for the assessment of pressures in the antropyloroduodenal region.